Application No.: 10/708,927 Docket No.: 11657-00004-US

AMENDMENTS TO THE SPECIFICATION

The Examiner noted several discrepancies with the use of symbols and mathematical equations in the Specification. These discrepancies are believed to be the result of problems in the text conversion process using USPTO electronic filing software.

Replacement paragraphs are provided below. To avoid confusion, paragraph numbering is provided with respect to U.S. Patent Application Publication No. US 204/0195511, published on October 7, 2004.

No new matter is involved with any amendment to the Specification.

Please replace paragraph [0093] with the following replacement paragraph:

[0093] Based on a ray-tracing calculation with the refractive index information shown in FIG. 5, a 67.5° Pellin-Broca prism made of ZnSe operating in the "short-side entrance" geometry at approximately the Brewster angle ~~(?$_B$ of ZnSe — 67°)~~ (θ_B of ZnSe ~ 67°) will give angular dispersion of about 6° between the 3 and 13 μm wavelength beams. The on-chip spatial separation between the different wavelengths is determined by the focusing optics used, the size of the Pellin-Broca prism, and the f-number of the system. A span of between 500 to 1000 cm^{-1} of the spectral range may be focused onto the FPA horizontally (256, 320, etc. pixels). Given the number of pixels in the FPA along the dispersion direction of the optical beam, the maximum resolution is about 5 cm^{-1}. However, using different optical components, such as a finer grooved grating, for example, a resolution of better than 5 cm^{-1} is readily achievable for this spectrometer.

Please replace paragraph [0097] with the following replacement paragraph:

[0097] In one aspect of this embodiment, IR detector 370 may be an InSb camera sensitive in the 3-5 μm wavelength range, for example, Merlin Mid model, manufactured by Indigo Systems. Such a detector includes a 320 x 256 pixel InSb detector, with 30 μm pixel pitch; a 3.0 - 5.0 μm changeable cold filter; user selectable frame rates of 15, 30 or 60 frame-per-seconds (fps) (minimum); a liquid nitrogen cooled dewar, having a minimum hold time of 4

hours; a noise equivalent temperature difference ~~NE?T < 20 mK;~~ NEΔT < 20 mK; user selectable integration times from 10 μs to 16.6 ms; and corrected non-uniformity < 0.1%. InSb detectors in this range may also be thermoelectrically cooled to enhance portability.

Please replace paragraph [0099] with the following replacement paragraph:

[0099] In another aspect, IR detector 370 may be a microbolometer camera, also manufactured by Indigo Systems as model Merlin Uncooled. This particular camera includes a 320 x 240 pixel microbolometer detector having 51 μm pixel pitch in a 7.5 – 13.5 μm spectral range. User selectable frame rates of 15, 30 or 60 fps (minimum) are available. This device, in contrast to the InSb camera, is thermoelectrically (TE) stabilized at 313K; has a noise equivalent temperature difference ~~NE?T < 100 mK;~~ NEΔT < 100 mK; and has user selectable integration times from 1 - 48 μs.

Please replace paragraph [0111] with the following replacement paragraph:

[0111] In another aspect of this disclosure, the IR FPA detector comprises an IR camera. ~~Ab~~ An InSb focal plane array (FPA) may be used to detect absorptions in the 3-5 μm range, while a microbolometer-based FPA may be utilized for the 7-13 μm range. Further, a MCT array, or other InSb or other type of array having a wider or different spectral response may be used. Further, the at least one output from the IR FPA detector includes a plurality of summed pixel outputs at each of a plurality of wavelengths present in the dispersed light beam. The plurality of summed pixel outputs at one of the plurality of wavelengths improves a signal-to-noise-ratio of a signal representing an intensity of said one of the plurality of wavelengths.

Please replace paragraph [0137] with the following replacement paragraph:

[0137] Conventionally, the source calibration process included a serial process of collecting the background power spectrum without a sample volume in the optical; collecting the sample power spectrum; and then dividing (or forming a ratio of) the sample power spectrum by the background power spectrum to determine the sample intensity/background intensity, or transmission, for every frequency position reported by the apparatus. Customarily, the data is

further processed by a logarithmic operation, i.e., determining the absorbance spectrum (ABS), as

~~ABS ? -log10 (sample/background).~~ ABS $\propto$ -$\log_{10}$ (sample/background).

Please replace paragraph [0147] with the following replacement paragraph:

[0147] The quantitative relation between the polarization direction and the sample dipole direction is depicted as follows:

~~$ABS_{Observed}$? cos (T),~~ $ABS_{Observed} \propto \cos(\theta)$.

Please replace paragraph [0178] with the following replacement paragraph:

[0178] With this in mind, the PAIR spectrograph of this disclosure may be applied to determine the anisotropic optical constants of the thin films. From an optics perspective, a monolayer film adsorbed on a dielectric substrate can conveniently be considered as a stratified three-phase system, such as that shown schematically in Fig. 8. The optical properties of the j^{th} phase are characterized by the complex refractive index $\tilde{n}_j$ where n_j is the real refractive index and k_j is the absorption coefficient, i.e., $\tilde{n}_j = n_j + ik_j$, where $i = \sqrt{-1}$.

~~where $i = \sqrt{-1}$.~~

Please replace paragraph [0180] with the following replacement paragraph:

[0180] Figure 9 shows reflection and refraction of infrared radiation that is incident on a dielectric substrate, where E is the intensity of the reflected radiation (at a given frequency); E' is the intensity of the transmitted (refracted) radiation; ~~?1~~ θ_1 is the angle of reflection, which is equal to the angle of incidence and is easily measured, and ~~?2~~ θ_2 is the angle of refraction. With this disclosure, it is possible to measure E, E' and ~~?2~~ θ_2. The angle ~~?2~~ θ_2 may be measured using the following procedure.

Please replace paragraph [0182] with the following replacement paragraph:

[0182] Once the values of E, E', ~~?~~$_{1}$~~,~~ ~~?~~$_{2}$~~,~~ θ_1, θ_2, $\tilde{n}_1$, $\tilde{n}_3$, and d are all known for several angles of incidence, the optical constants of the monolayer film (n_2 and k_2) can be determined using the Fresnel equations and a known iterative procedure. Using multiple angles of incidence ~~?~~$_{1}$ θ_1 improves the accuracy of these determinations.